1969 OPERATING SUMMARY

KINGSTON

water pollution control plant

LIE TD 227 K56 K56 1969 RES MOE COPY 71 ER MISSION c.1 a aa / LIBRARY ONTARIO WATER RESOURCES COMMISSION

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.

D.S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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KINGSTON

water pollution control plant

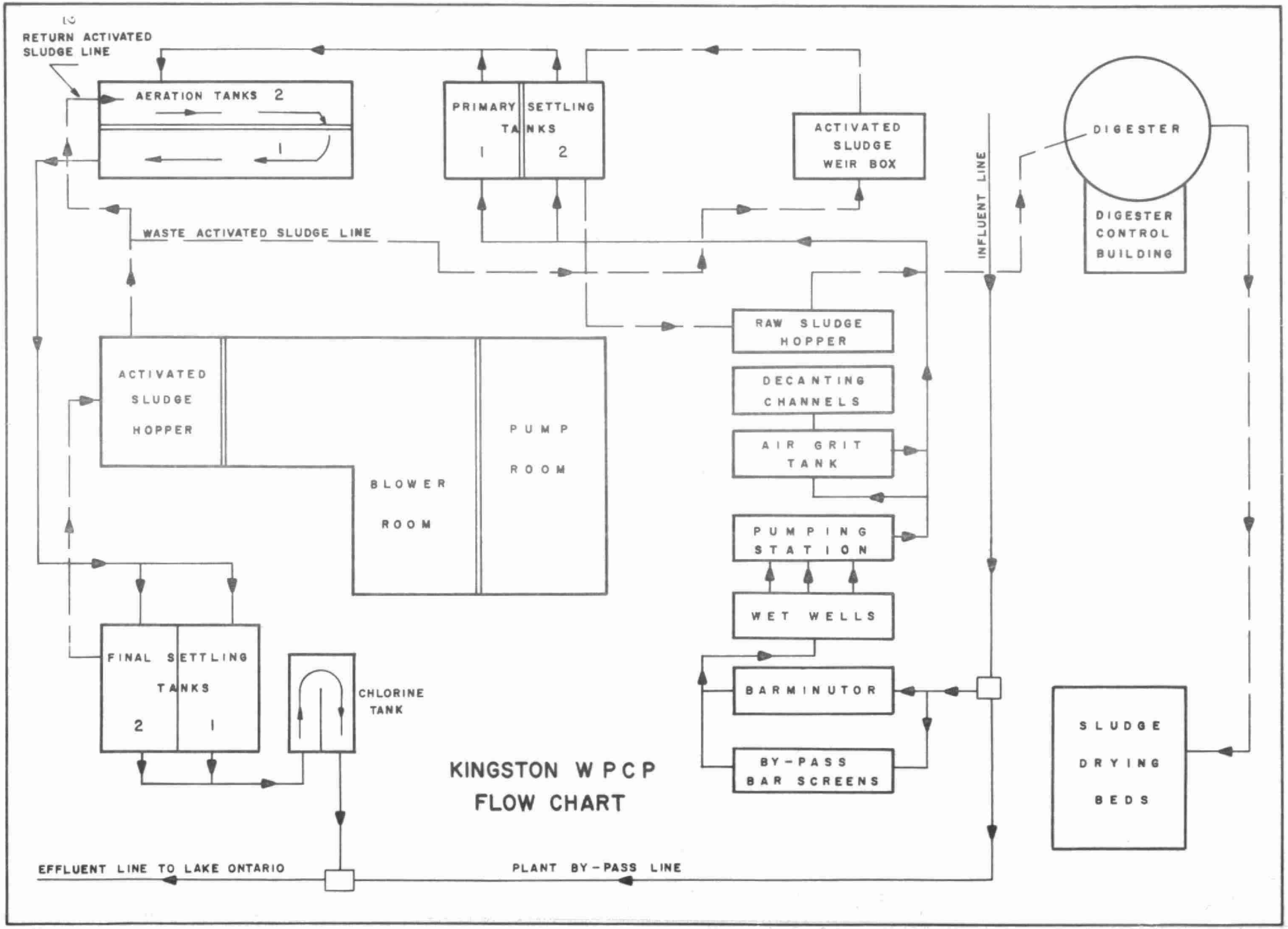
operated for

THE TOWNSHIP OF KINGSTON

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY


RETURN ACTIVATED SLUDGE LINE
AERATION TANKS 2
1
PRIMARY SETTLING TANKS
1
2
ACTIVATED SLUDGE WEIR BOX
INFLUENT LINE
DIGESTER
DIGESTER CONTROL BUILDING
WASTE ACTIVATED SLUDGE LINE
RAW SLUDGE HOPPER
DECANTING CHANNELS
AIR GRIT TANK
ACTIVATED SLUDGE HOPPER
BLOWER ROOM
PUMP ROOM
PUMPING STATION
WET WELLS
FINAL SETTLING TANKS
2
1
CHLORINE TANK
BARMINUTOR
BY-PASS BAR SCREENS
SLUDGE DRYING BEDS
KINGSTON W P C P
FLOW CHART
EFFLUENT LINE TO LAKE ONTARIO
PLANT BY-PASS LINE

DESIGN DATA

PROJECT NO.	2-0098-61	TREATMENT	Activated Sludge
DESIGN FLOW	0.83 mgd	DESIGN POPULATION	10,000
BOD - Raw Sewage	210 mg/l	SS - Raw Sewage	250 mg/l

PRIMARY TREATMENT

Comminution

Type: C.P. Barminutor
Size: One Model C (18")

Sewage Lift Pumps

Type: Weinman Type VBM
Size: Two 1200 gpm @ 35' tdh

Grit Removal

Type: Aerated; grit removed by air lift
Size: 1920 gal
Retention: 2 min

Primary Sedimentation

Type: Falk
Size: Two 46' x 12' x 7' 7" deep (8,380 cu ft or 52,200 gal)
Retention: 1.5 hours
Loading: Surface, 750 gal/ft^2/day
Weir, 8,600 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; Two-pass
Size: One tank 62' x 22.5' x 15' (each pass) (41,900 cu ft or 262,000 gal)
Retention: 7.6 hours

Air Supply

Type: Roots-Connersville
Size: Two 880 scfm

Diffusers

Type: C.P. Discfuser
Spacing: 63 diffusers per pass (wide band)

Secondary Sedimentation

Type: Falk
Size: Two 56' x 12' x 9' deep (12,100 cu ft or 75,600 gal)
Retention: 2.2 hours
Loading: Surface, 562 gal/ft^2/day
Weir, 5,050 gal/ft/day

CHLORINATION

- One W & T (100 lb/day)

Chlorine Contact Chamber

Size: One 27' 8" x 9' x 8' deep (10,300 gal)
Retention: 18 min

OUTFALL

- 3,000 ft to Lake Ontario

SLUDGE HANDLING

Digestion System

Type: Single stage, mixed by sludge recirculation
Size: One 55' dia x 20' swd (54,500 cu ft or 340,000 gal)
Loading: 0.57 lb/cu ft/mo
Recirculation pump - One Weinman: 150 gpm @ 65'

Sludge Drying Beds

- Four 80' x 20' (6,400 sq ft)

'69 REVIEW

EXPENDITURES

The total operating expenditure for the Township of Kingston Water Pollution Control Plant and associated pumping stations was $39,254.02. This was an increase of $379.02 above the budget of $38,875.00. The operating costs increased from 1968 by $2,798.12. The cost of treating 1,000,000 gallons of sewage was $113.78.

GENERAL

The raw sludge pump failed in October. Repairs were time-consuming, since parts were no longer available. The sludge withdrawal line was ruptured and also had to be repaired.

A BOD test kit was purchased for the plant to allow more determinations of the high BOD concentrations in the plant influent.

A sum of $9,500 was allocated from the Reserve Fund for the preparation of an engineering report by R.V. Anderson Ltd., Consulting Engineers. The report was to suggest a master plan for trunk sewers, in conjunction with the planning report adopted by the Township in 1969. Plant enlargement was also to be considered by the consultant bearing in mind the Township's industrial and domestic developments.

A meeting was held with officials of the Dupont Company of Canada Limited in November to discuss the possibility of discharging hexamethyldiamine waste from its plant to the treatment plant. Approximately 50 lbs. of HMD waste was discharged to the plant from November to the end of the year. No detrimental effect on the plant was attributed to this waste.

FLOWS

A total of 345 million gallons of sewage was treated. This represents an average of 940,000 gallons per day, a slight increase over the 1968 average of 860,000 gallons per day. Minimum daily flows of 600,000 gallons were recorded in January, February, August, September and October. The maximum daily flow occurred in December, when 2.4 million gallons were recorded on the average.

Chlorination of the final effluent is practised on a seasonal basis only. Chlorination was begun on May 15 and ended November 1. The average chlorine dosage of 3.1 milligrams per litre was required to obtain a 0.5 mg/l chlorine residual after a 15-minute contact period.

PLANT EFFICIENCY

The average concentrations of BOD and suspended solids in the plant influent were 405 and 574 mg/l respectively, a slight decrease from 1968 averages of 544 and 746 mg/l. These unusually high concentrations, obtained from composite samples, were caused primarily by the dumping of septic tank contents into a domestic sewer.

The average concentrations of BOD and suspended solids in the plant effluent were 41 and 74 mg/l respectively. This considerably exceeded the objectives of the OWRC. The effluent results were very similar to those obtained in 1968, when concentrations were 44 and 100 mg/l respectively. Operating difficulties again resulted from high organic loadings. Several meetings held with the Township regarding these high loads led to agreement that the disposal of septic tank contents in the sanitary sewers be discontinued. At the beginning of November, the Allen Construction Co. Ltd. was advised that alternative methods for such disposal would have to be found and that current methods should be completely discontinued by December 1.

The operation of the plant was considerably enhanced in December as this discontinuation took effect.

Operating problems associated with these high loadings had included the exceeding of the plant's air requirements, and bulking in the final tanks that caused sludge to flow over the weirs into the receiving water.

SLUDGE

A total of 1,084,000 gallons of raw sludge with an average concentration of 5.1% was pumped to the digester.

Digested sludge was removed by tank truck. A total of 1,192 cubic yards was removed from the plant.

In January, 1969, the sludge haulers requested cancellation of their contract because their large tank truck had difficulty in moving on the plant grounds. The disposal of the liquid sludge was again tendered and awarded to Mr. A. Lilis at a cost of 65¢ per cubic yard. This resulted in a considerable saving in the cost of sludge disposal from the previous contract of $1.69 per cubic yard. It is felt that an additional saving was realized because the Township of Kingston and the Division of Plant Operations located a disposal site close to the plant.

CONCLUSIONS

The plant was organically overloaded in 1969. This was due largely to the disposal of septic tank contents to the plant, a practice that was discontinued on December 1, 1969.

PROJECT COSTS

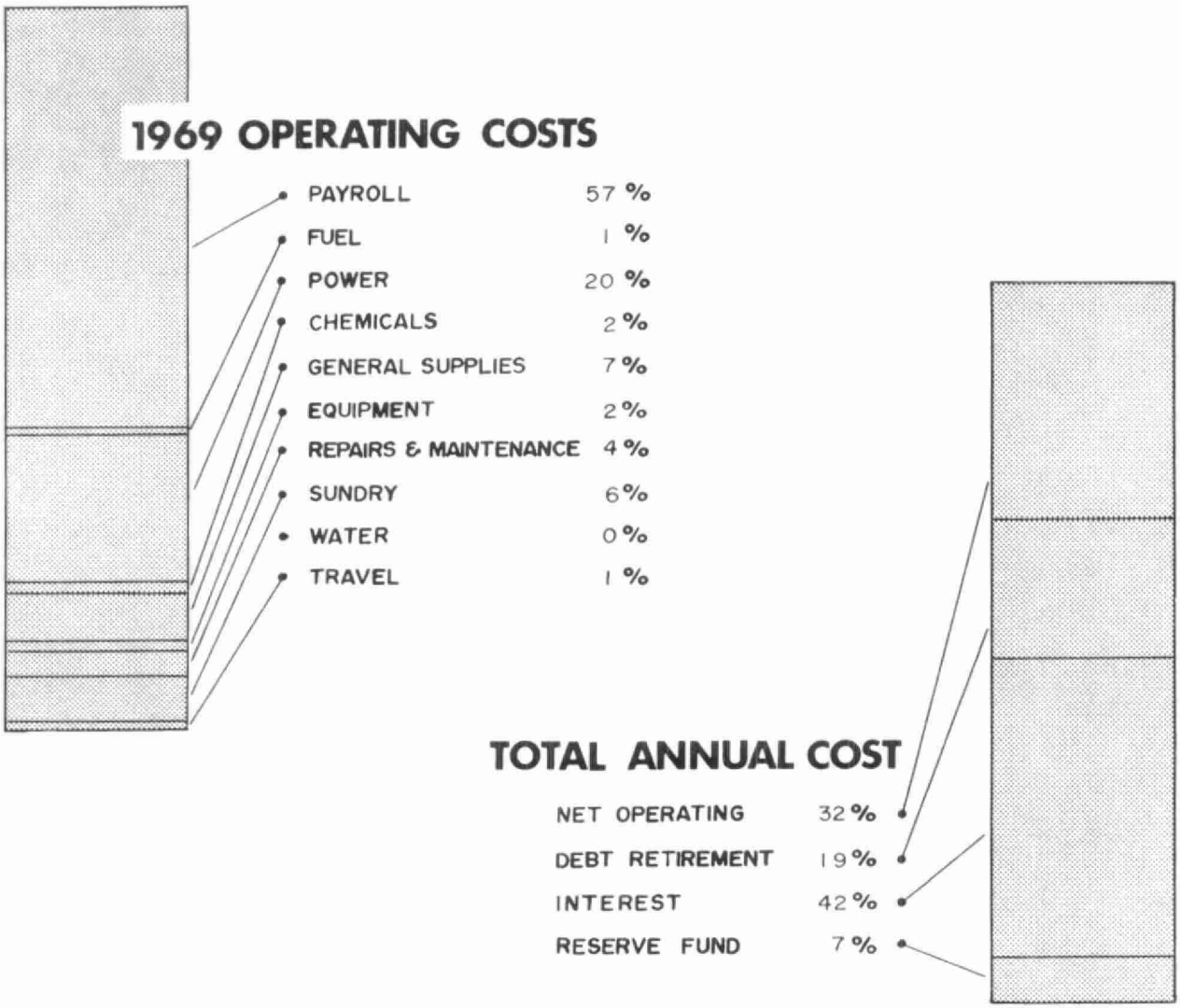
NET CAPITAL COST (Final)		$1,531,682.15
DEDUCT - Payments from Municipality	$156,782.00	
- Portion financed by CMHC/MDLB (Final)	431.721.56	588,503.56
Long Term Debt to OWRC		$ 943,178.59

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	$ 49,656.90

Net Operating	$ 39,254.02
Debt Retirement	23,636.00
Reserve	8,707.81
Interest Charged	52,803.72
TOTAL	$ 124,401.55

RESERVE ACCOUNT

Balance @ January 1, 1969	$ 42,668.60
Deposited by Municipality	8,707.81
Interest Earned	2,619.51
	$ 53,995.92
Less Expenditures	4,136.77
Balance @ December 31, 1969	$ 49,859.15



Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	181.105	$23,348.09	$128.92	10 cents
1966	186.699	25,674.25	137.52	7 cents
1967	258.570	30,775.98	119.02	4 cents
1968	314.02	36,455.90	116.09	2 cents
1969	345.0	39,254.02	113.78	3 cents

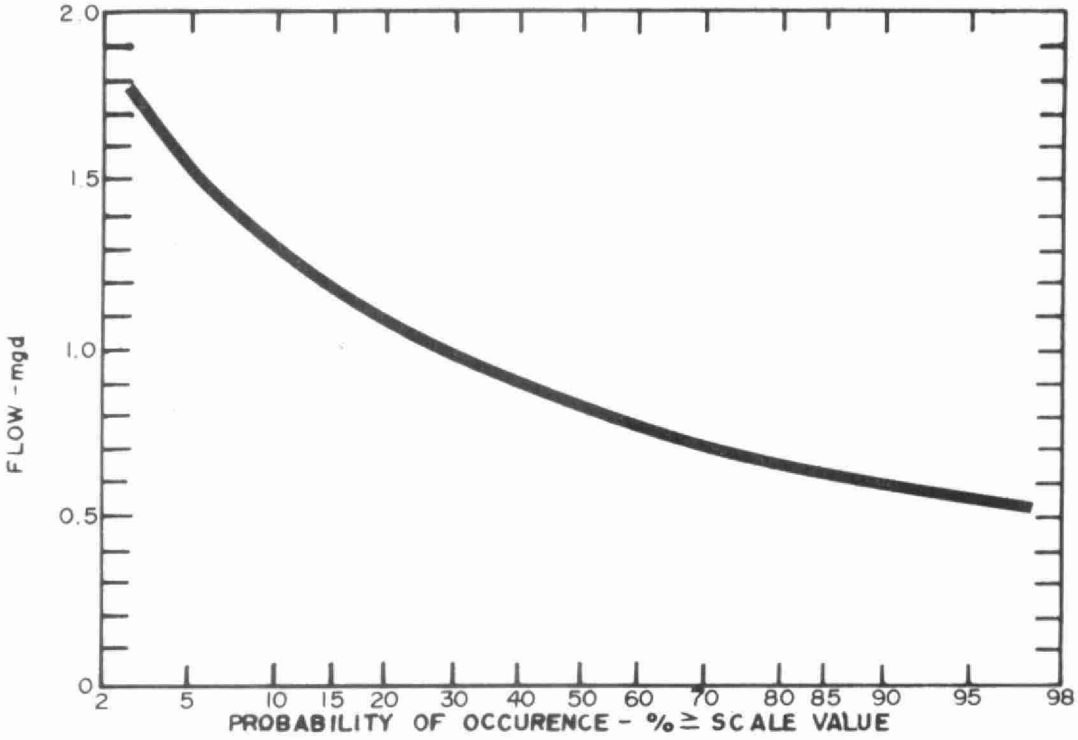
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS AND MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	2847.01	2675.59	-	-	-	-	10.10	-	-	161.32	-	-
FEB	3047.61	1687.63	-	-	738.36	-	284.05	227.29	-	110.28	-	-
MAR	3891.24	1635.42	-	63.72	736.88	-	289.53	-	268.20	897.49	-	-
APR	2783.26	1815.54	-	-	1146.70	-	203.86	23.77	131.00	(537.61)	-	-
MAY	2670.45	1839.55	-	78.72	688.23	-	145.77	(140.28)	40.00	18.46	-	-
JUNE	3212.31	1681.44	-	-	650.95	220.50	167.39	306.55	81.13	99.35	-	5.00
JULY	3477.65	1669.29	157.97	-	593.22	220.50	157.74	-	398.36	280.57	-	-
AUG	3656.61	2488.12	359.12	96.00	597.32	-	41.43	-	-	74.62	-	-
SEPT	3181.90	1690.19	45.76	-	641.97	220.50	356.21	72.98	25.03	129.26	-	-
OCT	2339.80	1639.86	-	-	-	-	149.91	183.51	217.60	148.92	-	-
NOV	3656.73	1644.05	-	-	1255.77	-	263.12	-	262.29	99.05	-	132.45
DEC	4489.45	1658.75	-	149.73	624.75	-	493.84	97.86	253.58	881.10	-	329.84
TOTAL	39254.02	22125.43	562.85	388.17	7674.15	661.50	2562.95	771.68	1677.19	2362.81	-	467.29

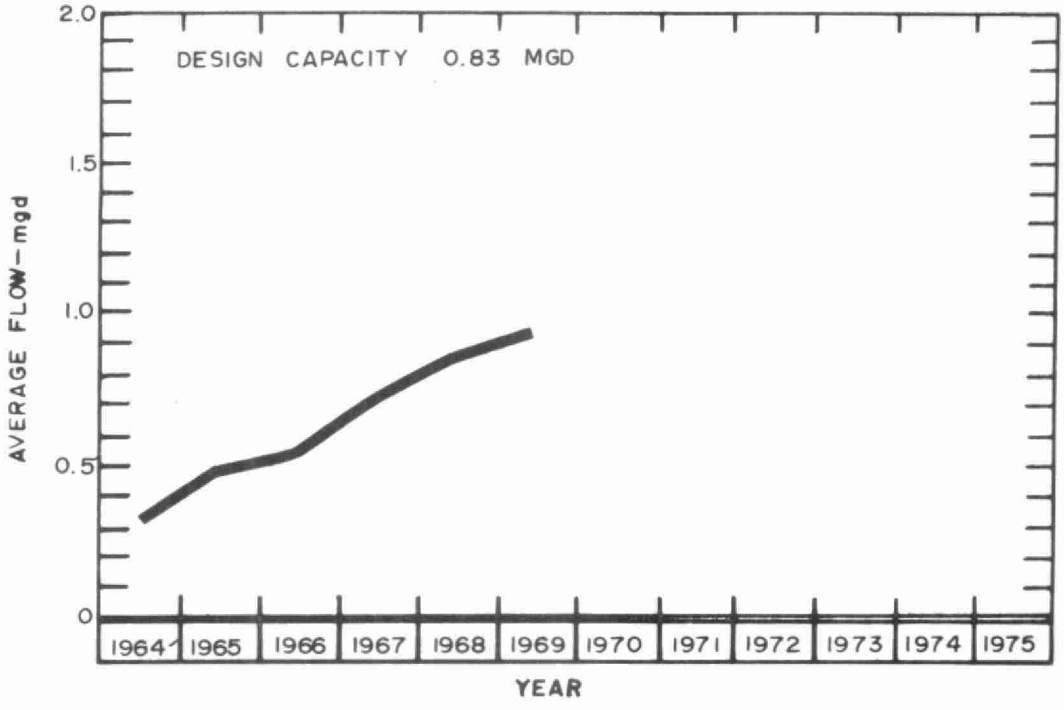
BRACKETS INDICATE CREDIT

* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $942.22

PROCESS DATA


2.0
1.5
1.0
0.5
0
FLOW - mgd
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

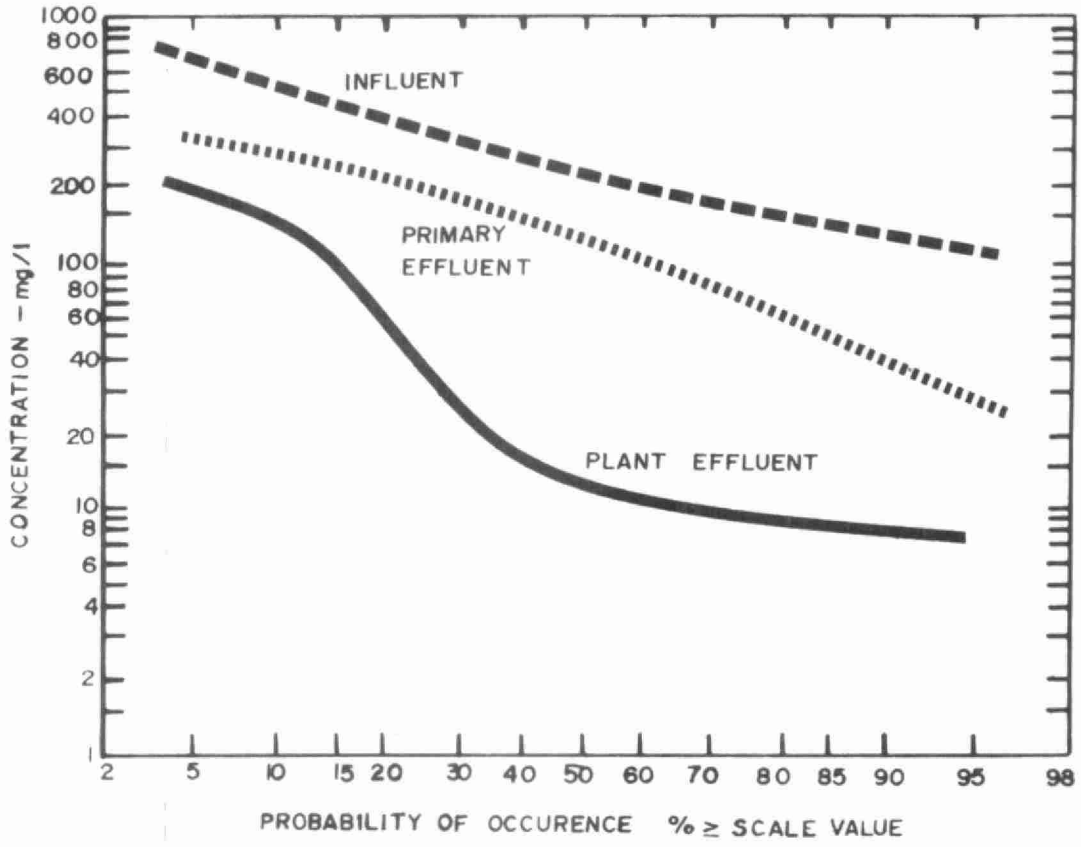
FLOWS


2.0
1.5
1.0
0.5
0
AVERAGE FLOW - mgd
DESIGN CAPACITY 0.83 MGD
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

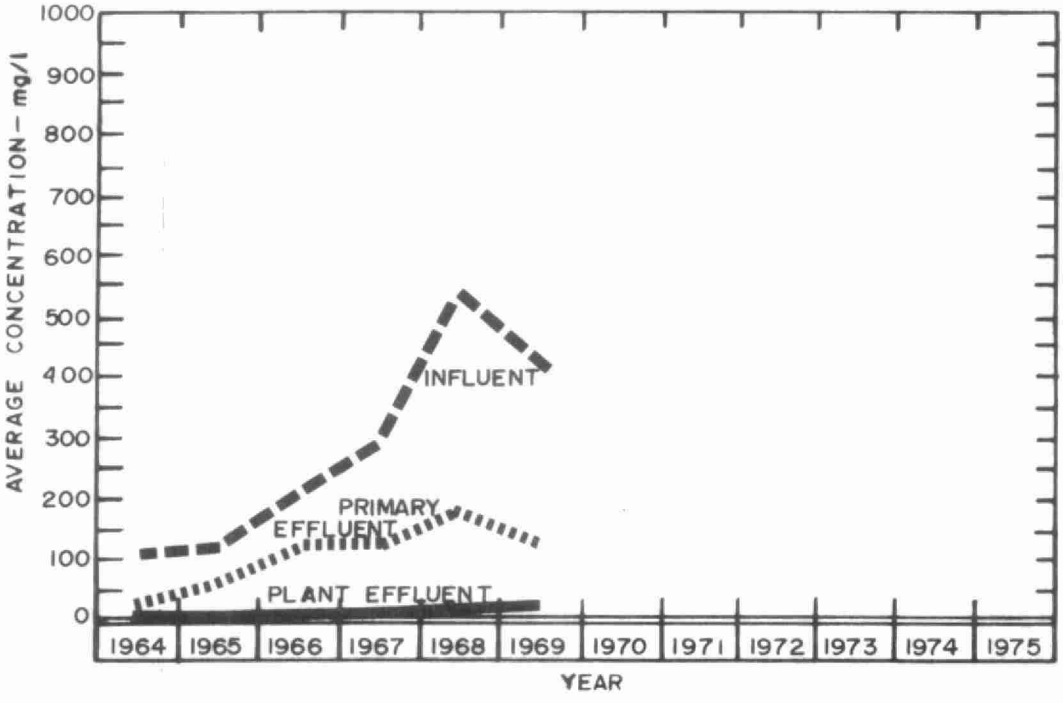
PLANT FLOWS and CHLORINATION

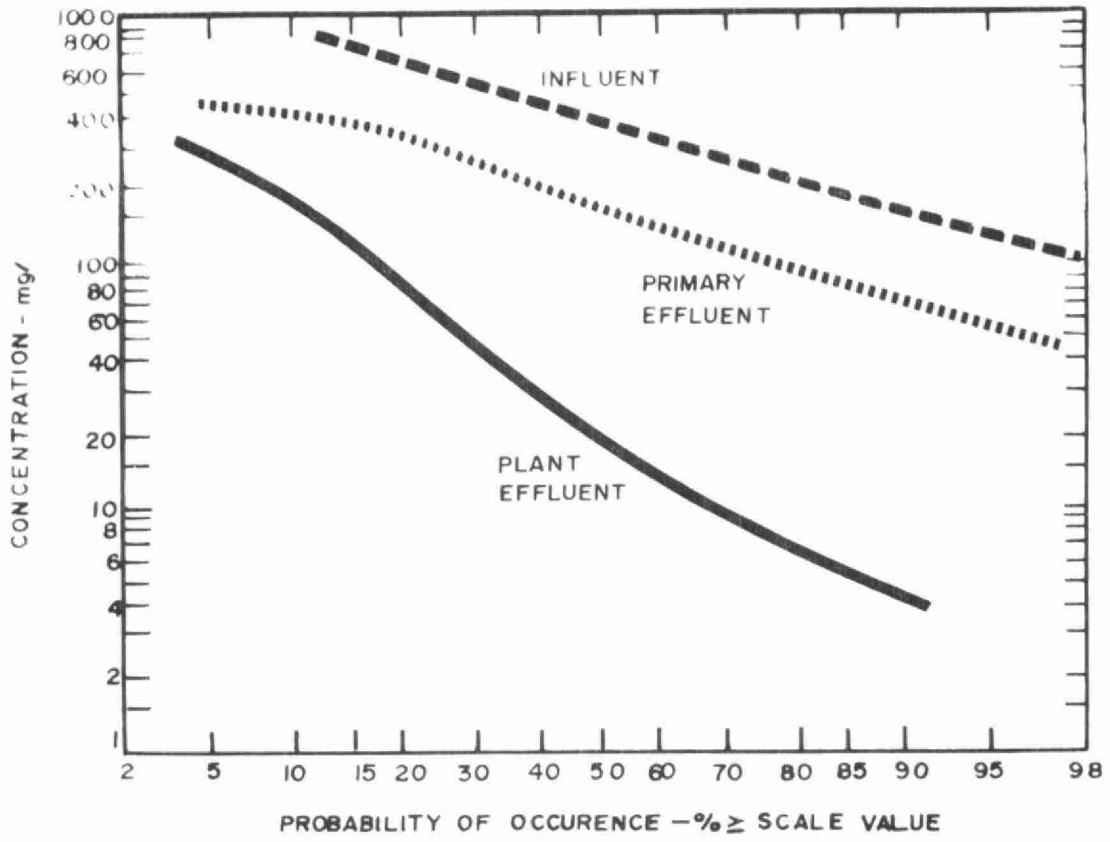
MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED pounds	DOSAGE mg/l
JAN	26.0	.8	1.9	.6	0	0
FEB	22.8	.8	1.2	.6	0	0
MAR	35.7	1.2	2.3	.7	0	0
APR	34.7	1.2	2.1	.9	0	0
MAY	30.7	1.0	1.6	.8	465*	1.5
JUNE	29.7	1.0	2.1	.7	878	3.0
JULY	28.8	.9	1.7	.7	792	2.7
AUG	28.1	.9	2.2	.6	781	2.8
SEPT	22.5	.8	.9	.6	679	3.0
OCT	22.9	.7	.9	.6	738	3.2
NOV	30.2	1.0	1.4	.7	20*	2.0
DEC	32.9	1.1	2.4	.8	0	0
TOTAL	345.0	-	-	-	4353	-
AVERAGE	-	0.9	-	-	726	3.1

* Chlorination between May 15 and November 2.

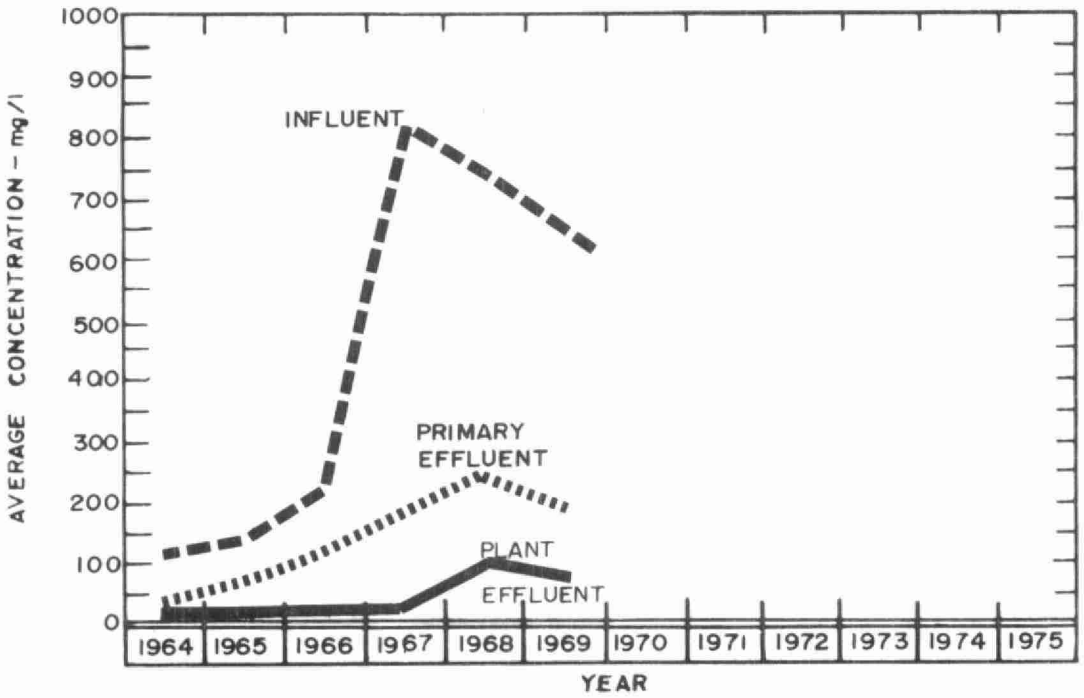


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS

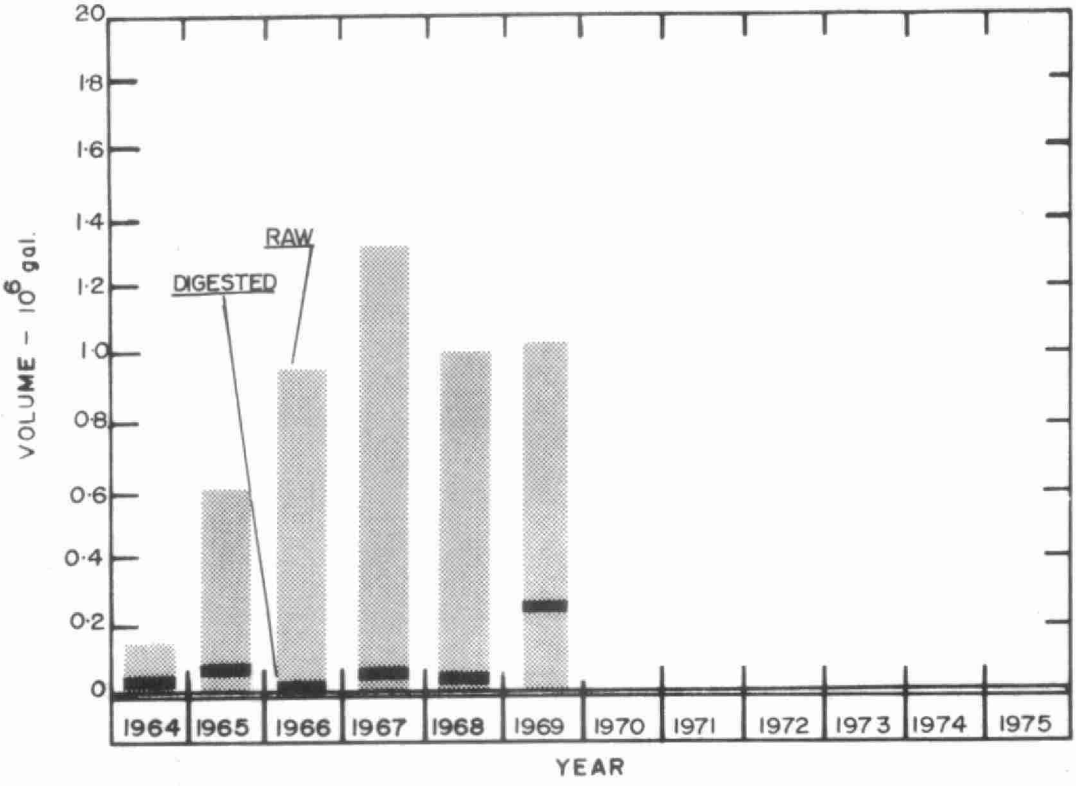


PLANT EFFICIENCY

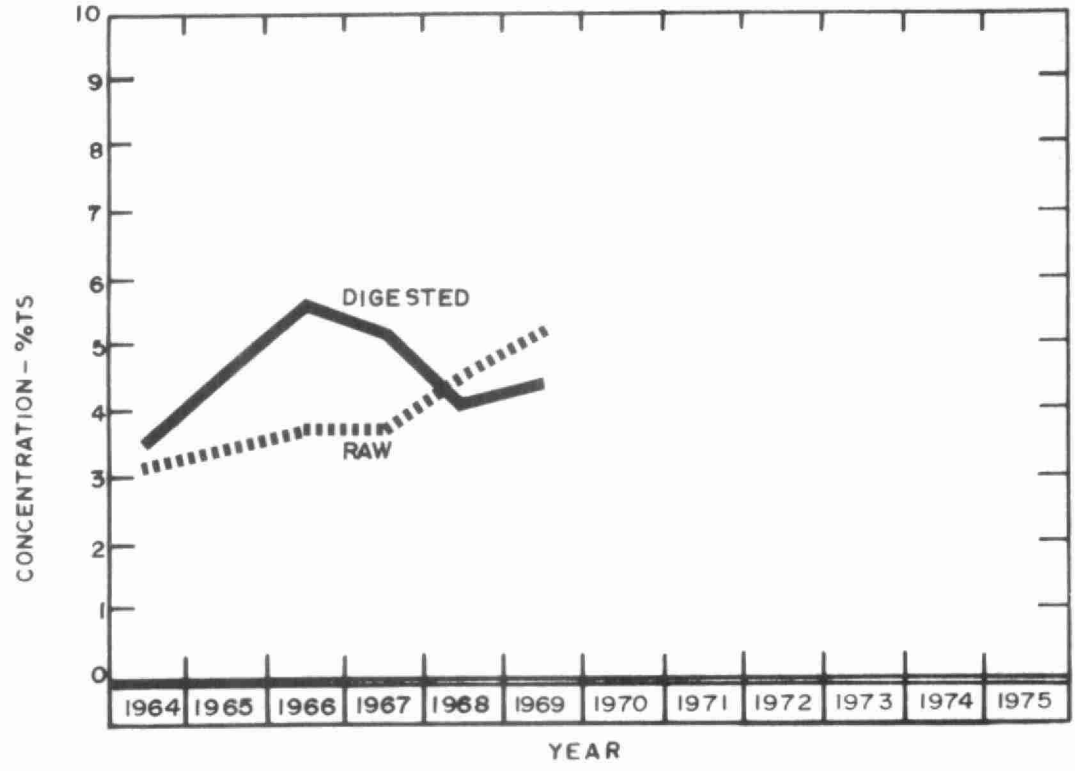
MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF.	EFF.	REDUCTION		INF. CONCN	EFF. CONCN	REDUCTION		
	mg/l	mg/l	%	10^4 pounds	mg/l	mg/l	%	10^4 pounds	cu ft
JAN	340	100	71	6.2	520	280	46	6.2	0
FEB	550	19	96	12.1	578	47	92	12.1	27
MAR	1650	33	98	57.8	1435	80	94	48.4	30
APR	350	15	96	11.6	795	40	91	26.2	18
MAY	385	11	97	11.5	780	17	98	23.4	10
JUNE	190	13	93	5.2	377	5	99	11.0	168
JULY	200	18	91	5.2	469	15	97	13.1	57
AUG	147	6	96	4.0	351	8	98	9.6	43
SEPT	290	22	92	6.0	775	29	96	16.7	39
OCT	317	135	57	4.1	210	260	0	-	40
NOV	233	122	48	3.4	398	91	77	9.2	12
DEC	209	11	95	6.5	195	10	94	6.1	72
TOTAL	-	-	-	-	-	-	-	-	516
AVERAGE	405	42	90	11.1	574	74	87	16.5	47

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb BOD / lb MLSS	AIR USED 1000 cu ft / lb BOD	WASTE SLUDGE 10^3 pounds
JAN	.8	140	255	100	280	2080	.22	.39	11.8
FEB	.8	110	227	19	47	1860	.18	1.76	16.4
MAR	1.2	190	390	33	80	2050	.41	.64	20.0
APR	1.2	150	140	15	40	2090	.31	.77	31.4
MAY	1.0	75	80	11	17	1880	.15	2.08	19.2
JUNE	1.0	172	177	13	5	1740	.37	.78	10.4
JULY	.9	47	203	18	15	2810	.06	.50	18.8
AUG	.9	225	294	6	8	3000	.26	.67	19.8
SEPT	.8	130	161	22	29	1620	.23	1.58	9.5
OCT	.7	215	150	135	260	1280	.48	1.86	5.1
NOV	1.0	85	122	122	91	1660	-	-	1.7
DEC	1.0	120	103	17	14	1670	.29	1.21	0
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	0.9	138	192	42	74	1978	.27	1.11	14.9


20
1·8
1·6
1·4
1·2
1·0
0·8
0·6
0·4
0·2
0
VOLUME – 10^6 gal.
RAW
DIGESTED
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

DIGESTION


10
9
8
7
6
5
4
3
2
1
0
CONCENTRATION – %TS
DIGESTED
RAW
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^3 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^3 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^3 gal	TOTAL SOLIDS %	DEWATERED cu yd	LIQUID cu yd
JAN	92.6	5.0	75	9.1	4.0	-	54.2	1.5	0	54
FEB	83.0	4.0	-	12.1	4.0	-	65.0	.8	0	72
MAR	85.2	5.0	-	12.7	-	-	99.7	.3	0	75
APR	93.1	5.0	76	10.1	-	-	56.4	.9	0	60
MAY	94.2	6.1	72	38.3	3.2	59	20.4	-	0	52
JUNE	87.1	4.0	-	56.5	-	-	45.6	2.5	0	249
JULY	94.4	4.6	71	11.1	4.5	55	60.0	-	0	66
AUG	87.5	5.5	-	20.2	-	-	48.0	-	0	120
SEPT	80.4	5.0	71	30.3	5.2	51	61.2	-	0	180
OCT	91.8	7.6	71	20.2	-	-	52.8	-	0	120
NOV	94.4	4.3	74	20.2	4.8	53	97.2	.2	0	60
DEC	100.8	5.3	58	14.1	5.0	51	47.6	-	0	84
TOTAL	1084.5	-	-	254.9	-	-	708.1	-	0	1192
AVERAGE	90.3	5.1	71	21.2	4.4	53	59.0	1.0	0	99

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